THE CARBON CONTINUUM IN THE SOLAR SYSTEM. A. R. Hendrix[1] and F. Vilas[1], [1]Planetary Science Institute, Tucson, AZ (arh@psi.edu).

Carbonaceous species evolve from hydrocarbons and organics to amorphous and glassy carbons to graphites with increasing levels of thermal processing and irradiation. Furthermore, in the ISM, heated grains tend to form aromatic structures and tend to crystallize, while cooler grains in denser regions stay amorphous and prefer aliphatic bondings [1]; we thus expect that bodies formed farther out in the solar system will exhibit more aliphatic signatures (especially in areas such as craters where unexposed material can be found) while those formed closer to the Sun will exhibit more aromatic signatures. Bodies formed still closer in should exhibit signatures of even more highly processed carbons such as amorphous carbon and even graphite. Because of this evolution, a "carbon continuum" is present throughout the solar system, with overall less-processed organics more present in the outer solar system and overall more-processed carbonized materials in the inner solar system. Spectral signatures of carbonaceous species – in the ultraviolet as well as at infrared wavelengths – mark the amount of processing experienced by a solar system object's surface and interior.

With exposure leading to thermal and irradiation processing, carbons and organics tend to lose their hydrogen component, ultimately leading to carbonization and graphitization. In the outer solar system (e.g. at Iapetus [2], comets 67P [5] and Halley [6], outer main belt asteroid Themis [3,7] and at dwarf planet Ceres [4]), complex organics can exhibit diagnostic spectral features in the UV and infrared. With more maturity, organics are expected to evolve from aliphatic (linear molecular chains) to aromatic (molecular rings). On this continuum, diagnostic features should appear, especially in the UV (<300 nm). As processing of carbon species occurs and H is lost, a UV absorption feature at ~ 220 nm forms. As more H is lost, the UV absorption narrows and shifts toward longer wavelengths, and is accompanied by an increasing brightness toward shorter wavelengths - the FUV rise, such as is seen at Ceres [1]. The more evolved carbonaceous surfaces in the inner solar system are more likely to display evidence of graphite or graphitized carbon and exhibit a stronger UV absorption feature and associated far-UV rise.

We present spectra of the diagnostic spectral shapes and examples from throughout the solar system.

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